

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

REMARKS

Claims 1-14 are all the claims pending in the application. Claims 1-3 and 8-14 are rejected. Claims 4-7 are objected to but would be allowable if placed in independent form. Claims 1, 2 and 4-8 have been amended. New claims 15-17 have been added.

As a preliminary matter, Applicants wish to advise the Examiner that the amendments to claims 1, 2 and 8 are supported at least by the description of page 3 line 20- page 4 line 2 and page 7 lines 7-15 in the original specification. In addition, new claim 15 is supported by the description of page 17 lines 13-21, new claim 16 is supported by the description of page 12 lines 15-24, and new claim 17 is supported by the description of page 14 lines 8-9, page 14 lines 15-18 and page 15 lines 5-6 in the original specification.

Claim Objections

Claims 4-7 are objected to as being in improper multiple dependent form. These claims have not been treated further on the merits.

Applicant has amended the objectionable claims in a manner that removes the basis for objection. Favorable consideration, on the basis of the arguments that follow distinguishing the invention from the prior art, is respectfully requested.

Claim Rejections - 35 U.S.C. § 102/103

Claims 1-3 and 8-10 are rejected under 35 U.S.C. § 102(a) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious in view of Koshiishi (55,474,807). This rejection is traversed.

The present invention relates to a method and a device for removing an excess and unnecessary portion of resist film that is formed on a region of a substrate surface that does not require a film for processing, and in particular, a method of manufacturing a photo mask blank. The object of the present invention is to prevent a non-uniform exposure sensitivity. Such non-uniformity can be created by a thermal hysteresis that is applied to the resist when a solvent is applied to remove an unnecessary portion of photoresist film. The application discloses several structural features that can prevent a non-uniformity of temperature on the film.

Koshiishi also relates to a method and the device for removing an unnecessary portion of resist film formed on a region of the substrate surface that does not require a resist, as well as to a method of manufacturing a photo mask blank. However, Koshiishi does not recognize the problem identified by the Applicants, does not acknowledge the above-mentioned object of the present invention, and therefore, does not teach the solution that is taught and claimed by the Applicant. Specifically, Koniishi does not teach the characteristics and the materials of the cover member used in the unnecessary film removing method as well as the unnecessary film-removing device.

Specifically, according to the present invention, the cover member is made of a material which has minimal transfer heat, and yet a necessary mechanical strength. As explained at page 17, such cover can be made of resin, glass or ceramic materials, or combinations thereof, which are positioned to minimize heat transfer. As a result, the exposure sensitivity of the resist film can remain uniform.

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

By contrast, the prior art methods and apparatus would result in a temperature distribution that becomes non-uniform. In this regard, Koshiishi does not disclose the above-subject matter, and therefore, the present invention is clearly patentable over Koshiishi.

Claim Rejections - 35 U.S.C. § 103

Claims 11-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koshiishi (55,474,807) in view of Hashimoto (5,958,630). This rejection is traversed.

Koshiishi already has been distinguished. Hashimoto does not remedy the deficiencies in Koshiishi. Hashimoto discloses only the method of manufacturing the alternative type phase shift mask which is generally used. Hashimoto does not disclose any method of removing an unnecessary resist film formed on the periphery portion of the phase shift mask blank, which has the above-mentioned object of the present invention.

Even if Koniishi and Hashimoto are combined, the invention as presently defined in claims 11-14 is patentable over the cited references because the cited references do not disclose the above-mentioned feature of the cover member of the present invention.

The new claims are clearly patentable because their limitations, with a goal of minimizing heat transfer and avoiding thermal hysteresis, is not found in the prior art.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE



23373

PATENT TRADEMARK OFFICE

A handwritten signature in dark ink, appearing to read 'Alan J. Kasper', written over a horizontal line.

Alan J. Kasper
Registration No. 25,426

Date: March 5, 2003

APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A method of removing, as an unnecessary film, an unnecessary portion of a [coating film] resist film formed on a surface of a substrate as a substrate surface, comprising:
 - covering said substrate surface with a cover member having a top;
 - supplying a solvent from the top of said cover member through a supply hole formed at a predetermined position of said cover member; and
 - dissolving said unnecessary film by said solvent;
 - the cover member defining a gap between an inner surface thereof and said substrate surface,
 - said substrate surface having an unprocessed region where said coating film is to be left as a necessary film and a processed region where said coating film is to be removed as said unnecessary film, [and]
 - said gap in said unprocessed region having a size such that temperature distribution is not caused in said [coating film] resist film under influence of heat transfer from said cover member,
 - and
 - said cover member being made of a material which hardly transfers heat such that exposure sensitivity of said resist film does not become nonuniform.

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

2. (Amended) A method of removing, as an unnecessary film, an unnecessary portion of a [coating film] resist film formed on a surface of a substrate as a substrate surface, comprising :

covering said substrate surface with a cover member having a top;

supplying said solvent from the top of said cover member through a supply hole formed at a predetermined position of said cover member; and

dissolving said unnecessary film by said solvent;

the cover member defining a gap between an inner surface thereof and said substrate surface,

said substrate surface having an unprocessed region where said coating film is to be left as a necessary film and a processed region where said coating film is to be removed as said unnecessary film,

said gap in said unprocessed region having a size such that temperature distribution is not caused in said [coating film] resist film under influence of heat transfer from said cover member, [and]

temperature distribution is not caused in said [coating film] resist film formed on a principal surface of said substrate due to convection of gas produced in said gap, and

said cover member is made of a material which hardly transfer heat such that exposure sensitivity of said resist film does not become nonuniform.

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

4. (Amended) A method as claimed [in any one of claims 1 through 3] in claim 1 or 2, wherein:

said gap has a size selected so that said solvent supplied to said gap is allowed to pass through said gap and spread in said gap in said processed region.

5. (Amended) A method as claimed [in any one of claims 1 through 4] in claim 1 or 2, wherein:

a string-like member having a predetermined thickness is interposed between the inner surface of said cover member and said substrate surface to serve as a gap defining member for defining a size of said gap between the inner surface of said cover member and said substrate surface in said processed region.

6. (Amended) A method as claimed [in any one of claims 1 through 5] in claim 1 or 2, wherein:

said unnecessary film is dissolved and removed by said solvent supplied through said supply hole while said substrate and said cover member are rotated together.

7. (Amended) A method as claimed [in any one of claims 1 through 6] in claim 1 or 2, wherein:

said solvent is supplied from the top of said cover member and also supplied from a rear side of said substrate towards said processed region.

AMENDMENT UNDER 37 C.F.R. §1.111
USSN: 09/935,569

8. (Amended) A device for removing, as an unnecessary film, an unnecessary portion of a [coating film] resist film formed on a surface of a substrate as a substrate surface by dissolving said unnecessary film with a solvent, comprising:

a cover member covering said substrate surface and having a top; and

a solvent supply unit for supplying said solvent from the top of said cover member;

the cover member having a supply hole through which said solvent from said solvent supply unit is supplied to said unnecessary film to thereby dissolve and remove said unnecessary film;

the cover member defining a gap between an inner surface thereof and said substrate surface,

said substrate surface having an unprocessed region where said coating film is to be left as a necessary film and a processed region where said coating film is to be removed as said unnecessary film,

said gap in said unprocessed region having a size such that temperature distribution is not caused in said [coating film] resist film under influence of heat transfer from said cover member and that temperature distribution is not caused in said [coating film] resist film due to convection of gas produced in said gap, and

said cover member is made of a material which hardly transfer heat such that exposure sensitivity of the resist film does not become nonuniform.

Claims 15-17 are added as new claims.